

Cloudscape Brazil 2019 – Global5G.org Position Paper

Mission Critical Communications – Towards 5G, Pre-commercial Procurement and the Integration of Satellite Communications



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Focus Area

Mission critical communications; public protection and disaster relief (PPDR); pre-commercial procurement for PPDR; integration of satellite in 5G

Who stands to benefit and how?

Satellite networks can be an effective complement to terrestrial networks, for example, when coverage is limited or subject to damage, by enabling global coverage through high-quality service availability. Diverse stakeholder groups benefit from coverage, resiliency and ubiquity, spanning public safety and security agencies, e.g. police, fire, ambulance and the military; people living and working in remote and/or underserved areas and network operators in meeting coverage requirements. Advanced broadband mission critical communications are also key to helping procurers find innovative solutions that enable ‘Operational mobility’ by overcoming current limitations due to fragmented mobile networks.

Position Paper

Mission-critical communications, primarily used by law enforcement, public safety and security agencies, such as police, fire, ambulance and the military, are essential for Public Protection and Disaster Relief (PPDR) operators, protecting lives every single day and in every corner of the world.

This position paper explores on-going standardisation work for PPDR by first looking at work towards globally harmonised standards through 3GPP SA6 on mission critical applications with enablers and a development toolkit for diverse vertical industries. We then go on to look at pre-commercial procurement for PPDR through the Horizon 2020 BroadWay project before zooming in on the role of satellite networks and their gradual integration in 5G.

A 3GPP Initiative: broadband mission critical communications

3GPP has responded to the evolving needs of public safety and security agencies through its work on Mission Critical Services (MCX) within its SA6 Working Group¹. The first steps were around Push-to-Talk services available over LTE networks. In this regard, there was strong support from the global public safety community, including FirstNet in the U.S., the UK Home Office, the Government of South Korea and the Police of the Netherlands.

3GPP initial work was on mission critical services in Release 13 brought together over 600 strong user requirements from public safety agencies. The architecture and detailed protocol specifications were developed for Mission Critical Push-to-Talk (MCPTT) within 12 months of the start of the work, allowing early adopter public safety communities to move voice services over as early as 2019².

On-going work builds on the strong LTE foundation in place, by evolving mission critical standards development further with MCX enhancements that introduce Mission Critical Video (MCVideo) and Mission Critical Data (MCData) and allow interworking with legacy Land Mobile Radio (MMR) systems, such as TETRA and P25.

Future work for 5G

The 3GPP SA6 Working Group has started work on its first study on MCX services over 5G. The publication of this work is expected in 2020.

Pan-European Mobile Broadband for Public Protection and Disaster Relief

Crime and disasters can occur anytime and anywhere, and they are not limited to fixed geographical borders. To tackle such disasters, European first responders need to be able to communicate, share and access information regardless of the country where they will respond. Yet Europe is naturally geopolitically fragmented with no harmonised spectrum for PPDR mobile broadband and no single mobile carrier covering the whole of Europe. The Horizon 2020 project, BroadWay, aims to tackle this very challenge³.

BroadWay is a team of 11 government/agency procurers from 11 countries that have come together to procure innovation activity that will enable a pan-European mobile broadband for PPDR⁴. The Request for Tenders was published by BroadWay in February 2019. The focus is to enable ‘Operational Mobility’, that is, enabling public safety responders to carry out their operations anywhere in Europe, whenever necessary, working alongside other responders located anywhere in Europe.

The BroadWay contract was signed with the European Commission in May 2019, building on the 10-year history of Public Safety Communications Europe (PSCE), a membership forum that is sustainable through involvement in many European level initiatives, including research projects and policy activities.

¹ 3GPP SA6, mission critical applications: specifications, <https://www.3gpp.org/dynareport/TSC-WG--S6.htm?Itemid=682>; 3GPP SA6, mission critical applications: work items, <https://www.3gpp.org/DynaReport/TSC-WG--S6--wis.htm?Itemid=683>.

² Suresh Chitturi, 3GPP SA6 Chair, Samsung, “A 3GPP initiative – Broadband Mission Critical Communications”, Enjoy! The ETSI Mag, July 2019, <https://www.etsi.org/newsroom/magazine>, p. 20.

³ David Lund, Project Coordinator: BroadWay, “Pan-European mobile broadband for Public Safety”, ETSI Mag, July 2019, <https://www.etsi.org/newsroom/magazine>, p.22.

⁴ <https://www.broadway-info.eu/>.

BroadWay Pre-Commercial Procurement

Broadway procurers have a common challenge: finding innovative solutions that enable 'Operational Mobility', breaking down current limitations due to fragmented mobile networks. The group of procurers is represented by Belgium (Lead Procurer), Czech Republic, Estonia, Finland, France, Greece, Ireland, Italy, Netherlands, Spain and Romania with Astrid.

Investments of €9 million will follow the BroadWay Pre-Commercial Procurement (PCP) Process across 3 phases: Design, Prototype, Pilot. The process is competitive throughout with pilot systems expected to reach technology level 8 (TRL8) within 2022.

Standards underpinning innovation procurement

Public Safety Communications Europe (PSCE)⁵ are a Market Representation Partner of 3GPP⁶ and has the primary goal of supporting the procurement activity. Its involvement in the recently formed Task Force with the 5G Automotive Association (5GAA)⁷, 5G Alliance for Connected Industries and Automation (5G-ACIA)⁸ and the 5G Infrastructure Association (5G-IA)⁹ as a sub-set of aforesaid market partners is aimed at supporting vertical industries in the 5G standardisation process.

Besides the PSCE remit with respect to Mission Critical Standards within 3GPP, PSCE also has two new CEN Workshop Agreements (CWA) in progress with member representatives as co-chair¹⁰. These CWAs are looking at semantic and syntactic interoperability alongside guidance on evaluating new technologies. The CWAs complement work within 3GPP by looking at interoperability layers sitting above the technical 3GPP mobile standards.

The Role of Satellite Networks for Disaster Relief and the Integration of Satellite in 5G

Satellite networks can be an effective complement to terrestrial networks, for example, when coverage is limited or subject to damage. Satellite networks can thus play an essential role by enabling global coverage through high-quality service availability.

Satellite coverage can support network operators in meeting their economic and legal requirements in reaching 100% of a territory and populations. Global coverage can be achieved beyond land masses, over oceans and in the air. What's more, satellite networks are enablers of diverse vertical industries, spanning media and broadcasting, rail, transportation and maritime, among others.

Critical Role of Standards

Several global standards organisations are playing a key role in developing the technical specifications needed not only to drive down costs through economies of scale but also and ensure flexibility, secure communication, availability and reliability. For example, the ETSI Technical Committee on Satellite Earth Stations and Systems (ETSI TC SES)¹¹ is developing standards for satellite technology, which is particularly useful for rural and outlying regions, where it is difficult to deploy other systems on a commercial basis. It therefore plays a key role in disaster relief and other emergency services while ensuring all European citizens can access high-quality information services.

Satellite communications, combined with terrestrial communications, are expected to support the assessment and handling of specific risks while also enabling an efficient coordination of rescue operations, firefighting and maintenance of public order. The technical specifications to meet these requirements are captured in ETSI TS 102 181¹². Another ETSI technical specification is ETSI TS 103 260¹³, which analyses a set of reference scenarios for the deployment of emergency communications. The TS focuses on communication needs triggered by earthquakes and mass casualty incidents in public transportation.

https://www.etsi.org/deliver/etsi_ts/102100_102199/102181/01.02.01_60/ts_102181v010201p.pdf

Four key requirements identified

- 1.** Temporary communication networks need fast deployment. Key to minimising operational constraints are lightweight and small-sized equipment for easy transport, self-set-up, autonomic operation and battery activated devices.
- 2.** Broadband and secure communication facilities to support the accurate assessment of situations in theatre and activate the appropriate logistical support accordingly.
- 3.** Flexibility and scalability to support any network typology and traffic demand.
- 4.** Availability: "It needs to work first time, every time", Public Safety Officials in the U.S.

5 <https://www.psc-europe.eu/>.

6 <https://www.3gpp.org/about-3gpp/partners>.

7 <http://5gaa.org/>.

8 <https://www.5g-acia.org/>.

9 <https://5g-ppp.eu/association/>.

10 <https://www.psc-europe.eu/news-events/news/408-psce-co-chairs-two-cen-workshops-on-driver-outcomes-in-berlin.html>.

11 <https://www.etsi.org/committee/1412-ses>.

12 https://www.etsi.org/deliver/etsi_ts/102100_102199/102181/01.02.01_60/ts_102181v010201p.pdf.

13 https://www.etsi.org/deliver/etsi_ts/103200_103299/10326002/01.01.01_60/ts_10326002v010101p.pdf.

3GPP Standardisation Roadmap

To drive down costs, public safety communications will be provided using 3GPP-defined cellular technologies (LTE and 5G) by benefitting from its economy of scale. Future satellite communications will also use the 5G technology framework, allowing the seamless integration with cellular network at service and possibly device level.

Possible satellite integration scenarios include: transparent based satellite network; regenerative based satellite network; backhaul via satellite network. Combining satellite and terrestrial networks ranges from satellite and terrestrial access in the same network to roaming between satellite and terrestrial access.

Key steps include consensus building also across diverse vertical industries with common requirements identified in the context of satellite communications during the 2nd 5G Vertical User Workshop co-hosted by 5G-IA, 5GAA, 5G-ACIA, PSCE in July 2019¹⁴.

The following technical reports (TR) and technical specifications (TS) chart the course towards 3GPP standardisation work as part of a stepwise process.

- › June 2018: 3GPP Study on New Radio to support Non Terrestrial Networks (Release 15), TR 38.811 under TSG RAN (Radio Access Network)¹⁵. Rapporteur: Thales.
- › June 2018: Study on using Satellite Access in 5G; Stage 1 (Release 16), TR 22.822, under SA WG1 (Services)¹⁶. Rapporteur: Thales.
- › December 2018: Service Requirements for the 5G system; Stage 1 (Release 16), TS 22.261, under SA WG1¹⁷. Rapporteur: Thales.
- › September 2019: Study on architecture aspects for using satellite access in 5G (Release 16), TR 23.737, under SA WG2 (Architecture)¹⁸. Rapporteur: Thales.
- › December 2019: Solutions for NR to support Non Terrestrial Networks (NTN) (Release 16), TR 38.821, under RAN WG3¹⁹. Rapporteur: Thales.
- › December 2019: Study on Management and Orchestration aspects of integrated satellite components in a 5G network, TR 28.808, under SA WG5 (network management)²⁰. Rapporteur: Thales.

Acknowledgements

Global5G.org has received funding under the European Union's Horizon 2020 research and innovation programme under grant agreement No 761816. Global5G.org is a Coordination and Support Action that supports 5G for vertical industries and their involvement in related standardisation work. It does so primarily through its role within the 5G-IA Pre-Standardization Working Group, and its contributions to the 5G-IA Verticals Task Force and the Task Force of the 3GPP Market Representation Partners comprising 5G Infrastructure Association, 5G Automotive Association, 5G-ACIA (Industrial Internet of Things) and Public Safety Communications Europe (PSCE).

References and Further Reading

- 3GPP SA6, mission critical applications: specifications, <https://www.3gpp.org/dynareport/TSG-WG--S6.htm?Itemid=682>
- 3GPP SA6, mission critical applications: work items, <https://www.3gpp.org/DynaReport/TSG-WG--S6--wis.htm?Itemid=683>
- Suresh Chitturi, 3GPP SA6 Chair, Samsung, "A 3GPP initiative – Broadband Mission Critical Communications", Enjoy! The ETSI Mag, July 2019, <https://www.etsi.org/newsroom/magazine>, p. 20.
- David Lund, Project Coordinator: BroadWay, "Pan-European mobile broadband for Public Safety", ETSI Mag, July 2019, <https://www.etsi.org/newsroom/magazine>, p.22.
- ETSI, Public Safety and Emergency Communications, <https://www.etsi.org/technologies/public-safety-emergency-communications>.
- ETSI Technical Committee (TC) on Satellite Earth Stations and Systems, <https://www.etsi.org/committee/1412-ses>
- Nicolas Chuberre, Vice Chair, ETSI TC SES, "Satellite Communications for disaster relief", ETSI Mag, July 2019, <https://www.etsi.org/newsroom/magazine>, p. 11.
- 2nd 5G Vertical User Workshop, 9-10 July, Rome, co-located with 3GPP SA6 Meeting, <https://www.global5g.org/2nd-5g-vertical-user-workshop-agenda#overlay-context=user>.
- The Need for 5G, <https://www.youtube.com/watch?v=9Wh09XJzKM8>.

¹⁴ <https://www.global5g.org/2nd-5g-vertical-user-workshop-agenda#overlay-context=user>.

¹⁵ https://www.3gpp.org/ftp/Specs/archive/38_series/38.811/38811-f10.zip.

¹⁶ https://www.3gpp.org/ftp/Specs/archive/22_series/22.822/22822-g00.zip.

¹⁷ http://www.3gpp.org/ftp/Specs/archive/22_series/22.261/22261-g80.zip.

¹⁸ http://www.3gpp.org/ftp/Specs/archive/23_series/23.737/23737-080.zip.

¹⁹ http://ftp.3gpp.org/Specs/archive/38_series/38.821/38821-070.zip.

²⁰ http://portal.3gpp.org/webapp/meetingCalendar/MeetingDetails.asp?m_id=33869.